PATENT SPECIFICATION

DRAWINGS ATTACHED

891,143

Date of Application and filing Complete Specification: June 26, 1985.

No. 20551/58.

Complete Specification Published: March 14, 1962.

Index at Acceptance:—Class 120(1), B1D; and 140, G.

International Classification:—D01b. D04j.

COMPLETE SPECIFICATION

Improvements in a Method of Manufacturing a Non-Woven Fibrous Sheet

I, JOSHUA HAROLD GOLDMAN, a citizen of the United States of America, of Hadlyme, County of New London, State of Connecticut, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

My present invention relates to a method of forming non-woven fibrous web with high tensile strength in every direction in its plane.

The principal object of the present invention is to provide a web of fibrous material in which the fibers are disposed in a heterogeneous non-parallel mass of uniform weight.

A further object of the present invention is to provide a novel method of manufacturing a fibrous web comprising a heterogeneous mass of non-parallel fibers.

Another object of the present invention is to provide a method of manufacture which is suitable for either natural or artificial textile fibers or blends thereof.

With the above and other objects and advantageous features in view, my invention is more fully disclosed in the detailed description following, in conjunction with the accompanying drawing and more particularly defined in the appended claims.

In the drawings,

Fig. 1 shows diagrammatically the apparatus and method of manufacture, and

Fig. 2 shows diagrammatically an alternative form of apparatus and method of manufacture.

It has been found desirable to provide a cotton or other fibrous material in an extremely thin non-woven web composed of intertwined fibers. Such a web has many uses both in industry and in medicine. For example, it can be made of absorbent material and when manufactured by the present method will have high absorbent qualities. In a known method, the web produced will have considerable tensile strength longitudinally in the plane of the web, but will be found to separate quite easily transversely to the plane of the web. The present invention provides a novel method of manufacturing a fibrous web which will result in considerable tensile strength both longitudinally and transversely in the plane of the web.

The desired web can be made of any fibrous material, either natural or artificial, or blends thereof. The method of the present invention is designed to intermingle the fibers in a heterogeneous mass of non-parallel fibers, giving the resultant web tensile strength in every direction in the plane of the web.

Referring to the drawings, Fig. 1 shows the disposition of the various portions of standard textile machinery components for carrying out the process of the present invention. The fibers are first run through the conventional machines resulting in the picker lap 10. The picker lap 10 then passes through the conventional feed rolls 11 and over the lickerin 12 rotating in a clockwise direction. The lickerin 12 is preferably provided with metallic clothing with 13—24 convolutions and 12 teeth to the inch. The lickerin should be rotated at a surface speed of approximately 1200 feet per minute. Adjacent the lickerin, I provide the cylinder 14, also rotating clockwise and having surface teeth pitched in the same direction as the metallic clothing 13 on the lickerin 12. The cylinder 14 is, therefore, provided with metallic clothing with 15—28 convolutions and 16 teeth to the inch. The cylinder 14 should have a surface speed much greater than the lickerin 12 and approximately 2500 feet per minute. The picker lap 10 is, therefore, pulled by the cylinder 14 from the lickerin 12 at a high rate of speed, causing an attenuation of the lap, resulting in a thin web of uniform weight.

Adjacent the cylinder 14 I now provide a fancy or stripper 16 rotating in a counter-clockwise direction at a surface speed greater than the surface speed of the cylinder 14. A surface speed of 3000 feet per minute is preferable. It should be noted at this point

SEE ERRATA SLIP ATTACHED

BNSDOCID: <GB___891143A__I_>

PATENT SPECIFICATION

DRAWINGS ATTACHED

891,143

Date of Application and filing Complete Specification: June 26, 1985.

No. 20551/58.

Complete Specification Published: March 14, 1962.

Index at Acceptance:—Class 120(1), B1D; and 140, G.
International Classification:—D01b. D04j.

COMPLETE SPECIFICATION

Improvements in a Method of Manufacturing a Non-Woven Fibrous Sheet

ERRATUM

SPECIFICATION NO. 891,143

Page 1, Date of Application and Complete Specification *for* "June 26, 1985" *read* "June 26, 1958"

THE PATENT OFFICE,
9th December 1969

D 119991/1

the fibers are disposed in a heterogeneous non-parallel mass of uniform weight.

A further object of the present invention is to provide a novel method of manufacturing a fibrous web comprising a heterogeneous mass of non-parallel fibers.

Another object of the present invention is to provide a method of manufacture which is suitable for either natural or artificial textile fibers or blends thereof.

With the above and other objects and advantageous features in view, my invention is more fully disclosed in the detailed description following, in conjunction with the accompanying drawing and more particularly defined in the appended claims.

In the drawings,

Fig. 1 shows diagrammatically the apparatus and method of manufacture, and

Fig. 2 shows diagrammatically an alternative form of apparatus and method of manufacture.

It has been found desirable to provide a cotton or other fibrous material in an extremely thin non-woven web composed of intertwined fibers. Such a web has many uses both in industry and in medicine. For example, it can be made of absorbent material and when manufactured by the present method will have high absorbent qualities. In a known method, the web produced will have considerable tensile strength longitudinally in the plane of the web, but will be found to separate quite easily

Referring to the drawings, Fig. 1 shows the disposition of the various portions of standard textile machinery components for carrying out the process of the present invention. The fibers are first run through the conventional machines resulting in the picker lap 10. The picker lap 10 then passes through the conventional feed rolls 11 and over the lickerin 12 rotating in a clockwise direction. The lickerin 12 is preferably provided with metallic clothing with 13—24 convolutions and 12 teeth to the inch. The lickerin should be rotated at a surface speed of approximately 1200 feet per minute. Adjacent the lickerin, I provide the cylinder 14, also rotating clockwise and having surface teeth pitched in the same direction as the metallic clothing 13 on the lickerin 12. The cylinder 14 is, therefore, provided with metallic clothing with 15—28 convolutions and 16 teeth to the inch. The cylinder 14 should have a surface speed much greater than the lickerin 12 and approximately 2500 feet per minute. The picker lap 10 is, therefore, pulled by the cylinder 14 from the lickerin 12 at a high rate of speed, causing an attenuation of the lap, resulting in a thin web of uniform weight.

Adjacent the cylinder 14 I now provide a fancy or stripper 16 rotating in a counter-clockwise direction at a surface speed greater than the surface speed of the cylinder 14. A surface speed of 3000 feet per minute is preferable. It should be noted at this point

SEE ERRATA SLIP ATTACHED

BNSDOCID: <GB___891143A_I_>

BNSDOCID: <GB_____891143A_I_>

891,143 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

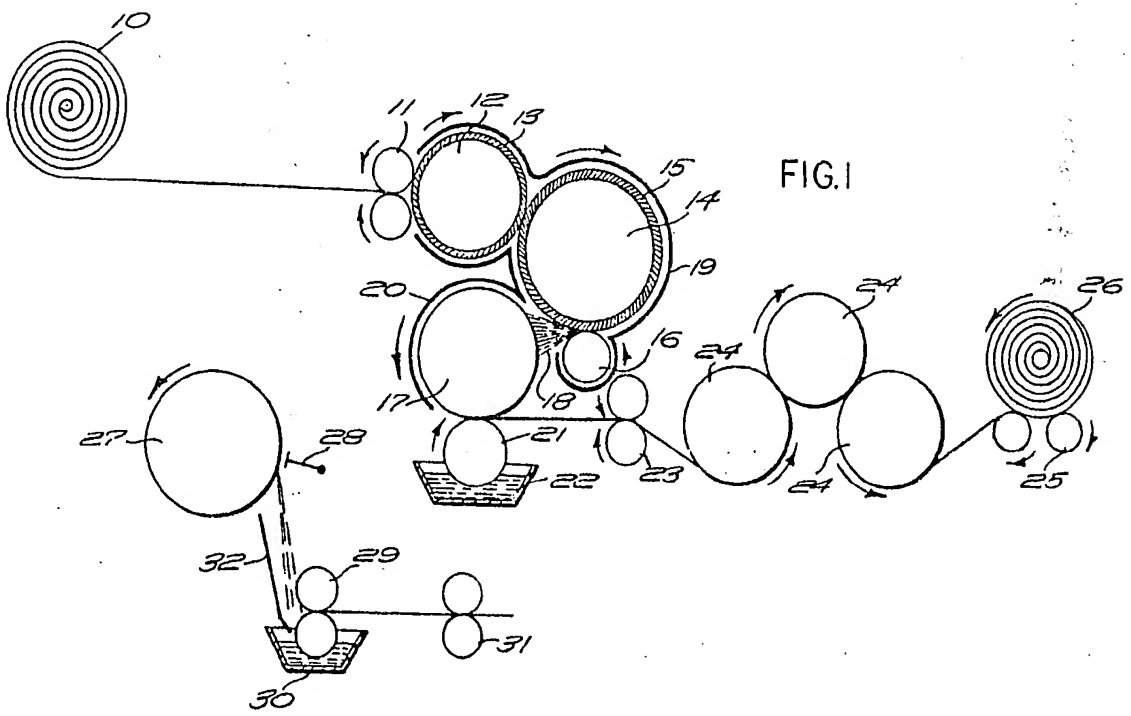


FIG.1

FIG.2

THIS PAGE BLANK (USPTO)

891,143
1 SHEET

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.

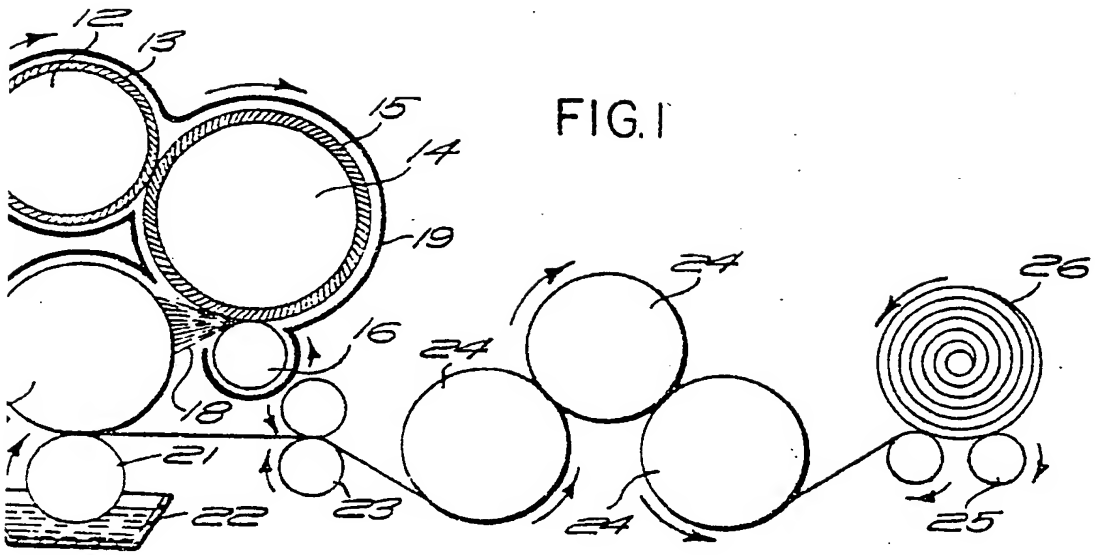
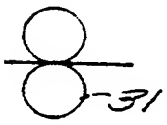


FIG. 1



BNSDOCID: <GB___891143A_I_>

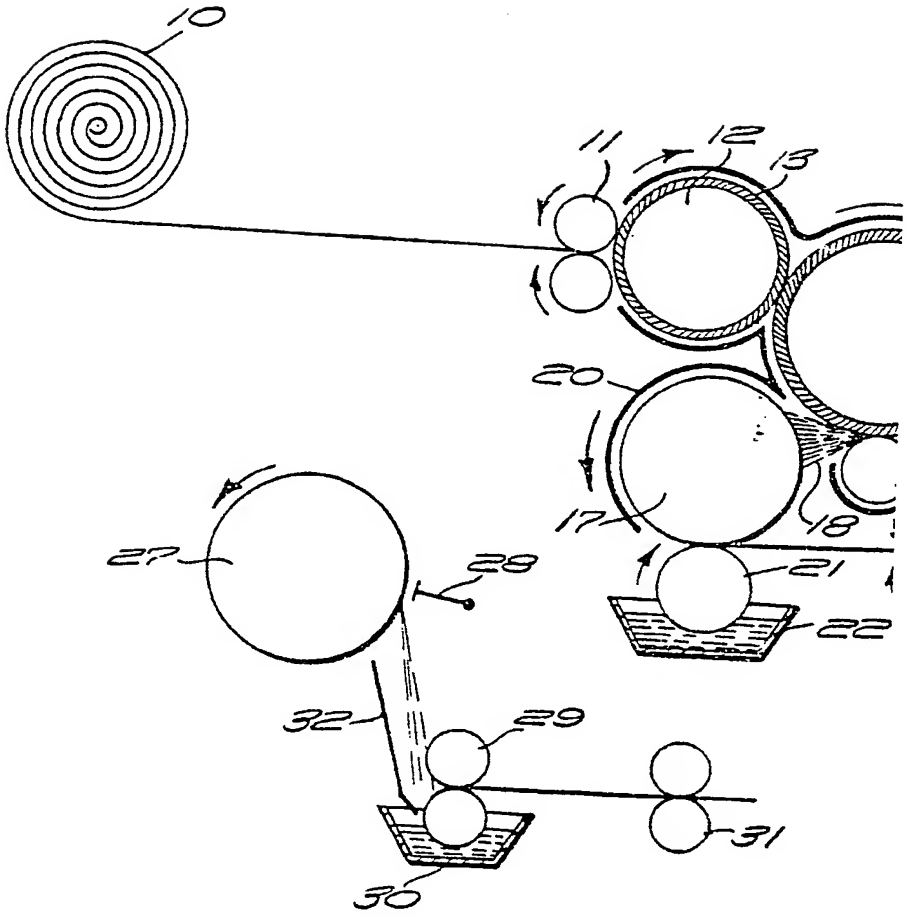


FIG.2

NSDOCID: <GB____891143A__I_>

that the surface speeds given herein are for comparative purposes only and may be varied provided the speed differentials indicated herein are substantially maintained. The stripper 16 is provided with a flexible clothing, or may be provided with metallic clothing, 32 convolutions and 20 teeth to the inch. The high speed counterclockwise rotation of the stripper 16 will clear the attenuated lap from the cylinder 14 and deposit the fibers uniformly upon the condenser 17 rotating in a counterclockwise direction. The condenser 17 may be covered with rubber or wool. At this point, the fibers impinging on the surface of the condenser 17 from the fancy or stripper 16 are in a uniformly distributed non-parallel heterogeneous state. The condenser 17 rotates at a surface speed variable from 10 to 60 feet per minute causing a crowding of the heterogeneous mass of fibers upon its surface as it comes from the stripper 16.

The lickerin 12, cylinder 14, stripper 16 and condenser 17 are preferably positioned as shown in Fig. 1 so that the fibers leave the cylinder 14 tangentially at right angles to a center line drawn through the centers of the cylinder 14 and stripper 16. The condenser 17 must be so disposed that the spray of fibers 18 impinge directly upon it.

The various parts hereinabove described are provided with appropriate shields 19 and 20. The shield 19 extends around the upper surface of the lickerin 12, across and around the cylinder 14 and around the lower portion of the stripper 16, as shown in Fig. 1. The shield 20 extends around the lower portion of the lickerin 12, then around part of the surface of the cylinder 14 and around the upper surface of the condenser 17, also as shown in Fig. 1. These shields are preferably positioned approximately .020" from the surfaces of the various rolls. This small clearance will prevent fly due to the centrifugal force, it will protect the personnel, and it will confine air currents caused by the toothed surfaces at high speed. The small clearance between the shields and the rolls provides for a boundary layer of air which acts to aid the untangling of the fibers. Note that the position of the shield 19 around the stripper 16 and the shield 20 extending part way between the cylinder 14 and condenser 17 insures the proper direction of the spray of fibers upon the condenser.

Directly below the condenser 17 and in contact therewith is a wetting roll 21 immersed in a pan 22. The pan 22 may contain water or some dilute adhesive such as starch or latex which may be varied to conform to any coating or finishing operation which may be desirable to perform on the final product. For example, the pan may contain solvent for one of a mixture of fibers acting as a binder in the dissolved state, or it may contain a chemical that will gelatinize or hydrolize the surface of the fibers, thus causing them to be adhesive and allowing them to be bonded when subjected to subsequent pressure in the squeeze rolls. The wetting roll rotates clockwise and the heterogeneous mass of fibers passing between the condenser 17 and wetting roll 21 will become impregnated with the wetting agent. From this point, the resultant web passes between the conventional squeeze rolls 23 around the drying cans 24 and into the batcher 25 which winds the same into a roll or web 26.

It will be found that by the above process a fibrous lap weighing 16 ounces to the square yard will result in a heterogeneous web of non-parallel fibers of approximately 100 grains to the square yard, or approximately 70 yards of 36 inch width to the pound when the condenser speed is 60 feet per minute. The thickness and weight of the finished web may be varied by varying the speed of the condenser 17 so that heavier webs can be formed. Because of the non-parallel intermeshing of the fibers, the resultant web will have considerable tensile strength in any direction in the plane of the web. The process hereinabove described lends itself to any type of natural or artificial fiber or any blends thereof.

As an alternative method of removing the web from the condenser 17, the method shown in Fig. 2 may be used. In this form a condenser 27 may be provided with doffer comb having 26 convolutions and 16 teeth to the inch instead of the rubber or wool covering and a conventional doffer comb 28 may be used to remove the web from the condenser and pass it between a pair of wetting rolls 29, the lower of which is immersed in a pan 30. From this point, the web can be passed through the squeeze rolls 31 and drying cans and batcher as shown in Fig. 1. An appropriate shield 32 may be provided to properly direct the movement of the web from the condenser 27 to the wetting rolls 29.

The above described machinery and process can readily be used to form webs of any fibrous material such as asbestos, paper or wood pulp, or glass fibers. In some instances a bonding agent may be used in the wetting process or a subsequent bonding agent applied to the finished web in any desirable manner. The main feature of the present invention is, therefore, the method of handling a fibrous structure resulting in a disruption of the parallelism of the fibers to form a non-woven heterogeneous mass of non-parallel fibers evenly distributed and of substantially uniform weight throughout. When properly processed, the resultant web can be made extremely thin, extremely light and with a high tensile strength in every direction in the plane of the web. The product can be made highly absorbent, as, for example, with cotton fibers. It can also be treated to make it waterproof. It can be dyed and it can be stiffened. The web can be used for insulation, for wiping cloths and in many other applications. Other advantages will be readily apparent to a person skilled in the art.

BNSDOCID: <GB___891143A_I_>

WHAT I CLAIM IS:-

1. Method of forming a non-woven fibrous web from a picker lap or other source of fiber stock containing a heterogeneous mass of non-parallel fibers, said web possessing a uniform tensile strength both longitudinally and transversely of the web, comprising the steps of attenuating the lap, disrupting the parallelism of the fibers to form a non-parallel, non-oriented mass of fibers and depositing said non-oriented fibers on a slowly rotating condenser, said steps being performed by passing said lap or fiber stock over a series of at least three rollers, the fibers following the periphery of said rollers, said rollers being shielded to confine air currents circulating therethrough and being operated at progressively higher surface speeds, the first two rollers rotating in one direction and the last roller rotating in the opposite direction and therefore depositing said fiber on said slowly rotating condenser.

2. Method as in claim 1, characterized by the second roller being adjacent said first roller and rotating in the same sens[illegible]a minimum surface speed of 2500 feet per minute, depositing the fibers by centrifugal force in a heterogeneous, non-oriented mass of uniform density upon a collecting surface to form a non-woven web, said fibers being deposited on said collecting surface by the last roller adjacent said second roller, which is rotating at a minimum surface speed of 3000 feet per minute.

3. Method as in claim 2, characterized by wetting the fiber with a bonding agent, squeezing the fibers into a thin heterogeneous, non-oriented web, and drying the same.

4. Method of forming a non-woven fibrous web from a picker lap or other source of fiber stock substantially as described and as shown in the accompanying drawings.

For the Applicant,
FRANK B. DEHN & CO.,
Chartered Patent Agents,
Kingsway House, 103, Kingsway,
London, W.C.2.

Printed for Her Majesty's Stationery Office by J. Looker Ltd., Poole, Dorset. 1962.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

SDOCID: <GB___891143A_I_>